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EXAMINER	
PADGETT, MARIANNE L	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/802,991	WONG, LAWRENCE D.	
	Examiner	Art Unit	
	MARIANNE L. PADGETT	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *4/22/2008 & 1/22/2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9 and 29-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9 and 29-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/22/8,1/22/8*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. Applicants' 1/22/2008 amendment has corrected some 112 problems as discussed in section 2 of the rejection mailed 10/22/2007, however it has created some new problems as discussed below.

Applicants are reminded supporting citations from their specification are supposed to refer to the application specification, not to the PGPub, which is a different document than that present in the PTO file. The examiner of sums that applicant citation of [0016] on page 9 of their 1/22/08 response, is the same paragraph as previously cited by the examiner on page 7 of applicant's specification. Applicant's allegation that one of ordinary skill in the art would understand that the list that variables "refer to the target not the electron beam" are not convincing, when the **specification explicitly** says "…Z,... E_o... voltage for it electrons...". The disclosure must be based on what is actually said therein, not what it should say to be meaningful. It is the specification that was sworn to, not the literature reference, which may actually say what applicants intend. Given that the specification also explicitly cites the Kanaya et al. reference discussing the formula, if applicants wish to amend their specification using this reference for prior art support, they may do so without creating a new matter issue due to the citation, providing all changes they make can be demonstrated to have support in the original specification, or combination thereof with the cited reference's discussion of the taught formula. Note this problem now also applies to new claims 46-47, not just claims 4 & 32 as previously discussed.

2. Claims 1-9 & 29-47 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

While applicants have amended independent claims 1 & 29 to correct the problem that the preambles were not commensurate in scope with the bodies of their claims, they have written a new claims 46 & 47 to have the same problems as previously present in the previous independent claims 1& 29, i.e. independent claim 46's preamble requires forming an integrated circuit with a dielectric film, but

the body of the claim does not, and independent claim 47's preamble requires forming a dielectric, while it is not necessitated by the claimed processed steps, thus these new claims are vague and indefinite.

In claims 1 & 29, applicants have added the limitation of "wherein the CDO film is unheeded during treatment", which presumably is referring back to the treating with an electron beam (EB), but since an electron impinging on a substrate inherently causes heating to occur, it is unclear what applicants mean by this new limitation. Is the intent that no external heat be added, or that the EB energy is so low that no energy is transferred from the EB as thermal energy (if that's possible, while having any effect on the substrate), or what? The claim limitation as presently written is either impossible or ambiguous. Also applicants have not cited where in their original specification support for this (& other) amendments to the claims are derived. The examiner found that on page 9, lines 20-25, where the claimed overall flux was taught for chambers at 8-50 mtorr (He or Ar), the chamber employed was at room temperature, where the context of the e-beam treatment conditions taught for processing included that applying heat to the substrate was optional, hence there is support for specifying applying or not applying heat separate (external) from the EB treatment, but the context of the original disclosure cannot be said to mean or support the e-beam treatment is prevented from heating the substrate, as would be required by the amended language for claims 1 & 29 as presently written.

Also in claim 1, while the preamble & body of the claim steps are now formally in agreement, with forming the CDO film & treatment thereof explicitly claim to result in the formation of the dielectric film & integrated circuit, it is unclear how a generic substrate with a dielectric CDO film thereon can be called or said to be an integrated circuit, as there is no structure claimed that could possibly carry any current, or operate as a circuit, etc., thus the source of or how the integrated circuit is formed is unclear.

To reiterate, Claims 4, 32 & 46-47, it is unclear what "a **predicted** Kanaya-Okayama range of electrons" (emphasis added) is, or how one would determine this predicted quantity. The examiner notes that on page 7, "the Kanaya-Okayama range" is defined as $r = (2.76x10^{-2}AE_0^{1.67})/\rho Z^{0.89}$, however as Z

appears to be said to be the atomic number of accelerated electrons, this formula would appear to be meaningless, because electrons do not have an atomic number, as they are not atoms! The atomic mass (A) of an electron can be input into the formula, but what the density (ρ) of an electron would be is unclear, although it could refer to electron beam current density. The examiner suspects that the disclosure on page 7 is defective, insufficiently describing the variables of the formula, however the result of this is that one cannot use the disclosure to figure out or predict claim values, thus making the meaning of the claimed predicted range unclear (and insufficiently enabled in the specification, see below). It is noted that the abstract of the article by Kanaya et al. is discussing an atomic model giving the potential between electrons & atoms with a formula related thereto, with the article's page 44 discussing the formula for scattering cross section, where Z is the atomic number of the **target**, suggesting to the examiner that the description of A, Z & maybe ρ as defined in applicant's specification is incorrect or incomplete, however while the cited article **might** possibly enable applicant to correct the above confusion (if so applicant should provide careful citations of support with **reasoning** on why the original specification necessitates **any** changes), the actual disclosure in the present specification is not clear, thus making the claims unclear. Also, in order to get a meaningful number out of the empirical formula, one must know what units to employ for the variables, and while the atomic mass (A) **might** be assumed to be atomic weight as listed on a periodic table, and the atomic number (Z) is a unitless value, one still needs to know the units for density & acceleration voltage for which the disclosed empirical formula was designed. A further potential problem, assuming A, Z & ρ are supposed to describe characteristics of the CDO film, is that this film has a molecular structure having at least two different types of atoms (C & O, others undefined), hence does not have a single atomic number that could be input into the formula, such that it would be unclear whether one is supposed to calculate "r" for each type of atom present in the molecular structure, or the proportional average of their properties, etc., & if calculated individually, whether all such calculations or merely one need to fit the claimed criteria, or what…. As presently

written, claims 4 & 32 are impossible to evaluate meaningfully with respect to the prior art, except possibly in terms of intended effect discussed on lines 13-16 of page 7.

With respect to claims 6-7 & 34-35, the amended claims now refer to dielectric film resulting from the process, so this problem has been corrected. On page 10 of applicant's response to a state without support back a dual damascene structure is a hole pattern in a dielectric, which the examiner notes is consistent with figure 7 & page 14, lines 5-10 of the specification, which shows a dual damascene structure as holes etched through what appears to be both a CDO dielectric & substrate, although the figures lack sufficient labeling to interpret with any surety. However as applicants have stated on the record, that a dual damascene is essentially any hole pattern in any dielectric, which is not inconsistent with the general disclosure of the specification, this is considered to provide file wrapper estoppel for the claim language to encompass such.

3. Claims 4, 32 & 46-47 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

See above discussion in sections1-2 concerning the Kanaya-Okayama range & formula therefore.

4. Claims 1-29 & 29-37 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The claims of "unheated during treatment" is ambiguously unsupported by the original specification, as there is no teaching that was found by the examiner to support the electron beam being prevented from causing heating during treatment therewith, as is encompassed by the present claim language, although the option of not applying heat to the substrate during electron beam treatment was

considered supported in the context of the taught treatment conditions supplied on page 9 of the original specification, as discussed above.

5. The disclosure remains objected to because of the following informalities: the continuing data provided in the preliminary amendment (10/10/2007, substituted for 3/16/2004) needs to be updated to show the current status of the parent application, which issued as PN 6,734,533 on 5/1/2004.

Appropriate correction is required.

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. With respect to **Shimada et al.** (6,746,969 B2), it is noted that while discussion of e-beam treatment in column 4 appears to of knowledge that electron beam irradiation causes heating, the

described process explicitly applies additional heat treatment to the substrate. Also exemplary dosages, such as they 5 $\mu C/cm^2$-sec. for about 180 seconds = 900 $\mu C/cm^2$, which is lower than the claimed values.

Note that since it is essentially impossible for any electron beam treatment to be providing a treatment to a substrate surface without heating occurring thereto, it could be considered that absolutely no prior art rejections could be made with respect to these claims as amended, however alternately one could consider that only heating the substrate via a means not directly provided by the electron beam itself is excluded (although it is noted that applicants' application provides no significance for additional heating of the substrate being either provided or withheld).

Shimada et al. teach a method of manufacturing a semiconductor device, which includes deposition of an insulating film, that is an organic silicon oxide film, such as that deposited from poly-methylsiloxane, which is cured via a combination of heating & electron beam irradiation, with teachings of the EB irradiation energy of about 5-200 keV & specific examples of 6 keV, 10KeV or 1-15 keV. It is taught that the particular EB curing techniques of Shimada et al. improves properties of the dielectric film, such as crack resistance & mechanical strength, while achieving desired low dielectric constants, which is important to its intended use as interlayer dielectric, so that the films durability during subsequent processing, such as dry etching or CMP processing, is excellent. Shimada et al. include disclosures concerning forming patterns in the EB treated/cured dielectric film in which copper wiring is then formed, followed by chemical mechanical polishing, which sequences of steps is considered to read on applicant's claims 6-9 & 34-37. Further note that the organic silicon oxide films or polymethyl siloxane films disclosed by Shimada et al. are considered to read on applicant's carbon doped oxide (CDO) films, as being a subset thereof. Particularly see the abstract, figures 1-2, 4-5 & 8-10; col. 1, lines 28-54; col. 2 for problems in past techniques' results & col. 2, lines 64-col. 3, line 21, plus col. 5, lines 21-44 prior art EB curing techniques; Summary in col. 3; col. 4, lines 11-65, especially 37-41 for basic procedure; col. 5, lines 1-20 & 41-58 for advantages; col. 6, lines 22-39 for important EB parameter &

procedural techniques including EB irradiation reaching the inside of the film, plus the start of first embodiment describing figure 1 on line 43, particularly noting lines 53-60 describing wiring grooves filled with Cu metal with the process employing conventional CMP techniques; col. 7, lines 1-58+4 first embodiment procedure, especially noting step 1 & 4 described on lines 7-16 & 33-55; col. 9, lines 15-61 for comparative results; col. 10, especially lines 19-26 & 48-68+ for mechanistic effect, such as e-beam cutting of CH_3 groups; col. 11, lines 31-44 & 61-col. 12, lines 68 for further advantages & effects of parameters; col. 13, lines 24-27 & 32-53; col. 15, lines 48-54; col. 17, lines 44-56; col. 21, lines 34-col. 22, lines 20 & 47-59; col. 23, lines 60-65; col. 25, lines 25-37; col. 27, lines 34-52; and see col. 28, lines 38-col. 29, lines 22 for further alternatives applicable to the taught process, such as the use of different insulating film materials for the organic silicon oxide, such as SOG films, or employing alternative deposition techniques than spin coating, or use for insulating films other than interlayer dielectrics.

8. With respect to new limitations, note that **Leu et al.** (6,605,549 B2) teach that the chamber in which the electron beam exposure occurs may range from 35°-450°C (column 5, lines 40-63), where is considered that a temperature on the order of 35°C during electron beam treatment, essentially has no heat input from any source except the electron beam, hence while not teaching that the e-beam treatment is unheated, it would have been obvious to one of ordinary skill in the art that in order to employ the lower range of temperatures as taught, that no external heat would be applied during electron beam processing, in fact it would've been further obvious to one of ordinary skill, that control as in cooling might actually be required. However the further teaching concerning the electron beam dose requires 10-500 μC/cm2, which is smaller than claimed values Note claim numbers 1-3, 5-9, 29-31 & 33-37 were consistent with those as set forth with respect to sections seven & 10 of the action mailed 10/22/07.

To reiterate, Leu et al. (549) are teaching improved nucleation & adhesion of subsequent depositions via CVD or ALD on low dielectric constant (low-k) dielectric layers, inclusive of carbon-

doped oxide, that may have been deposited via CVD techniques & patterned for making interconnections with a lower metal layer using single or dual damascene processing techniques known in the art. Various treatments of the dielectric layer to generate or enhance polar groups or polar sites are taught to include processing techniques, such as electron beam treatment, where the electron beam treatment option employs acceleration voltages that may range from about 0.5-20 keV, with about 3 keV exemplified as a preferred parameter when used to treat CDO dielectric layers with electron dosage of about 20 $\mu C/cm^2$ at about 400°C. Leu et al. teach that the dose and acceleration voltage selected will be proportional to the degree and depth of desired surface modification respectively. After this treatment a barrier layer is deposited via CVD or ALD techniques, and may be formed of material such as Ta, TaN, Ti, TiN,..., followed by deposition of a metal seed layer, that may be Cu, then plating of a metal layer, such as copper plating, after which possible subsequent processing includes chemical-mechanical polishing. Particularly see the abstract; figures; col. 1, lines 8-30, especially 8-13 & 25-30; col. 2, lines 1-20 & 49-57; col. 3, lines 1-41, especially 13-17, 28-32 & 38-41; col. 5, lines 1-15 & 26-63; col. 7, lines 34-50; col. a, lines 6-67, especially 6-11, 25-36, 43 & 65-66; col. 9, lines 22-35; and col. 10, lines 5-24 & 40-45, plus claims 1-4, 7, 9, 11-14 & 16.

9. It is noted that **Livesay et al.** (6,132,814) requires simultaneous heating with IR heaters, thus explicitly added outside heat source, although the electron dose of 2500-10,000 $\mu C/cm^2$ (column 6, lines 25-50), is overlapping with claimed values.

Note that since it is essentially impossible for any electron beam treatment to be providing a treatment to a substrate surface without heating occurring thereto, it could be considered that absolutely no prior art rejections could be made with respect to these claims as amended, however alternately one could consider that only heating the substrate via a means not directly provided by the electron beam itself is excluded (although it is noted that applicants' application provides no significance for additional heating of the substrate being either provided or withheld).

To reiterate, Livesay et al. teach electron beam exposure of siloxane spin-on glass (SOG) deposits, which may be considered a species of deposit covered by "carbon doped oxide", as the glasses are oxide material & the siloxane contains carbon or organic components, thus reads on carbon doping. Livesay et al. combined their electron beam treatment with heating in order to overcome problems noted in the prior art, so that large doses of high-energy electrons may be employed without inducing damage or deleterious effects in the oxide layers. It is taught that sufficient electron energy is selected to fully penetrate the full thickness of the SOG layer, providing 9 keV for a 6000 Å thick film as an example; that their curing techniques provides protection against cracking; and that carbon organic groups are expelled from the oxide film, so that there is no subsequent water uptake by the oxide & increased resistant to wet etch processes. Particularly see the abstract; col. 1, lines 10-29; col. 3, lines 52-col. 4, lines 23 (prior art problems) & lines 62-col. 5, lines 36 & especially lines 60-66; col. 6, lines 16-51+.

Note that while Livesay et al. do not discuss applicant's formula or the "Kanaya-Okayama range", they teach that there electron energy, i.e. acceleration voltage, is sufficient to penetrate the full thickness and on the of the coating being treated, thus while it is impossible to calculate whether the exemplary 9 keV provides the claimed relationship with respect to the disclosed formula due to the deficiencies in the specification (discussed in section 2 above) affecting ability of someone to use the disclosed formula, it is noted that page 7 of the specification when discussing the effect with respect to the Kanaya-Okayama range teach "Typically, the entire cross-section of the CDO film will be exposed to electron flux and thus in preferred embodiment of the Kanaya-Okayama range is greater than the thickness of the CDO film", which appears to have the equivalent meaning of the teachings of Livesay et al., which require the electron energy to fully penetrate the full thickness of the layer, hence it would appear that Livesay et al's exemplary energy & film thickness inherently reads on applicant's claimed formula due to equivalent effects occurring. Alternately, it would've been obvious to one of ordinary skill in the art when employing electron beams for curing a film to be sure to use sufficient energy to enable sufficient dosage

of electrons to penetrate the entire thickness i.e. cross-section, of the film in order to effect the desired curing of the film, otherwise uncured material would remain at deeper levels of the coating.

10. Claims 1-4, 29-32 & 46-47 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Moghadam et al. (6,936,551 B2).

Claims 1-9 & 29-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moghadam et al. as applied to claims 1-4, 29-32 & 46-47 above, and further in view of **Livesay et al.** (6,132,814), discussed above in section 8 or **Leu et al.** (6,605,549 B2) discussed in section 7 above, optionally further in view of Thompson (4,027,052)..

Note that since it is essentially impossible for any electron beam treatment to be providing a treatment to a substrate surface without heating occurring thereto, it could be considered that absolutely no prior art rejections could be made with respect to these claims as amended, however alternately one could consider that only heating the substrate via a means not directly provided by the electron beam itself is excluded (although it is noted that applicants' application provides no significance for additional heating of the substrate being either provided or withheld).

For the e-beam processing, Moghadam et al. include temperature ranges for the wafer of 0°C-1050°C, thus is inclusive of both heating the substrate & not heating the substrate, i.e. possible meanings of the unheating limitation, while the total dose of electrons applied may range from 1-100,000 $\mu C/cm^2$, thus is also inclusive of claimed ranges, hence may be considered to read on the claims, however alternatively as there are a wide range of values given for both parameters, it would've been obvious for one of ordinary skill in the art to optimize values in order to achieve optimum and locate dielectric films. Alternatively, it would've been further obvious to one of ordinary skill in the art to review analogous processing techniques using electron beams on analogous coating, in order to effect optimization employing claimed values, such as found in of **Livesay et al.** (814), or **Leu et al.**, as discussed above, where such teachings provide narrower showings of claimed temperature or claim dosages, such that such

values would have been expected to provide optimization related to the narrower claims, especially considering the uncertainty in claimed meanings.

To reiterate, in Moghadam et al. (6,936,551 B2), see abstract; col. 3, lines 55-col. 4, lines 27; col. 8, lines 10-col. 9, lines 44, especially note in col. 8, lines 18-22 energy beam dosages are taught to vary in the range of about 0.1-100 KeV, where dose & energy are selected to be proportional to the thickness of the film treated. Maghadam et al. teach the deposition of dielectric films including via CVD or spin-on deposition, etc., where deposited low dielectric films are taught to contain silicon, oxygen & carbon, with carbon content possibly being between about 10-30 atomic %, which is considered to read on the claimed carbon doped oxides. Note that the teaching concerning the energy dose being proportional to the thickness of the film, is considered to either read inherently on the disclosed intent of applicant's "range" of claims 4 & 32, or alternately to have been obvious for reasons as discussed in section 8 above.

While none of the above primary references employ a formula as provided in applicant's specification, Thompson, who is curing a polyvinyl ferrocene layer via electron beam, teaches that electron beam voltage is determined by the desired crosslinking polymer material, where optimum conditions for crosslinking are based on desired production of gelation at the interface, and Thompson provides an equation for determining such voltages in terms of thickness of the film (abstract; col. 6, lines 64-col. 7, line 15), hence considering these teachings of Thompson would have general applicability to any e-beam layer curing process, it would have been obvious to one of ordinary skill in the art to apply equivalent concepts to any of the primary references e-beam treatments in order to provide sufficient e-beam energy to accomplish taught treatments by deriving an analogous formula for calculating required electron beam voltages to apply to the particular materials of the primary references in order to produce desired treatment effects, which in all cases may be applied to the entire thickness of the taught dielectric material being electron being treated.

11. Claims 1-9 & 29-47 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3, or 1-12, or 1-18, or 1-11 of U.S. Patent No. 6,417,098 B1, or 6,432,811 B1, or 6,703,324 B2, or 6,984,518 B2 in view ofMoghadam et al., optionally in view of Livesay et al. or Leu et al. and Thompson (4,027,052) for claims 4 & 32.

The patented claims are all directed to use of dielectric material that is cured and/or patterned to make interlayer dielectric structures in which metal, such as copper, is deposited & in (098), (324) & (581) CPM is performed thereon. With respect to the dielectric film (098) explicitly claims "carbon-doped oxide layer", (811), (581) & (324) claim "an oxide of silicon", where all these patented claims differ from the present claims by not having any claims direct to electron beam treatment (i.e. none of the claims to patterning &/or curing, specify the means thereof) of the dielectric layer, which encompasses CDO layers either explicitly or as a narrower overlapping species. The secondary & tertiary references of or Livesay et al., or Leu et al., or Moghadam et al (all discussed above in sections 6-11), are all directed to analogous processes, where e-beam treatment is used to effect either a superior curing techniques than would be produced by thermal curing, or to provide a superior deposition surface for subsequent depositions consistent with those desired in the patented claims, or to provide patterning the use of an electron beam, where all these electron beam treatment techniques of the secondary references are applied to dielectric materials used in structures as in the patented claims & composed of compositions consistent with patented claims, as well as the presently claimed CDO film in the instant application, hence it would've been obvious to one of ordinary skill in the art to apply electron beam treatment for any of the reasons as supplied by the references for the benefits taught therein (also using specific materials as discussed in the references) & in order to accomplish the objectives of the claims, as these techniques are consistent with & complementary to the claimed limitations. Note with respect to electron beam energy requirements, the teachings of each reference is relevant to its combination & reasons for obviousness with respect to energy choice, as discussed above, are also applicable here.

12. Applicant's arguments filed 1/22/2008 & discussed above have been fully considered but they are not persuasive.

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marianne L. Padgett whose telephone number is (571) 272-1425. The examiner can normally be reached on M-F from about 8:30 a.m. to 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks, can be reached at (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Marianne L. Padgett/
Primary Examiner, Art Unit 1792

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